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Mr Andrew Hall
Deputy Chief Inspector of Rail Accidents
Cullen House
Berkshire Copse Rd
Aldershot
Hampshire GU11 2HP

Dear Andrew,

RAIB Report: Derailment and collision, Watford tunnel 16 September 2016

I write to provide an update¹ on the action taken in respect of recommendation 1 addressed to ORR in the above report, published on 10 August 2017.

The annex to this letter provides details of the action taken regarding the recommendation. The status of recommendation 1 is '**implemented**'.

We do not propose to take any further action in respect of the recommendation, unless we become aware that any of the information provided has become inaccurate, in which case I will write to you again.

We will publish this response on the ORR website on 7 August 2019.

Yours sincerely,

Oliver Stewart

¹ In accordance with Regulation 12(2)(b) of the Railways (Accident Investigation and Reporting) Regulations 2005

Recommendation 1

The intent of this recommendation is to mitigate the risk of a future slope failure at this historically vulnerable location. Effective implementation of the drainage work described in paragraph 144 is likely to contribute to implementation of this recommendation.

Network Rail should implement measures to improve surface drainage (eg by provision of a suitable drainage system encompassing the crest), in the vicinity of the 2016 Watford tunnel landslip. It should also investigate whether it is necessary to take steps to manage sub-surface flows which were observed during this accident and could reoccur during a future event.

ORR decision

1. Network Rail have now installed surface drainage at the crest of the slope. This will contain and direct concentrated surface water flows to the spillway structure and encourage clean water down to the cess and the Up-Side drainage system.
2. Network Rail have carried out an engineering assessment of sub-surface flows at Watford tunnel. The assessment concludes that the management of sub-surface flows is not required at this location for the following reasons:
 - The geology at the location is permeable and under normal rainfall conditions will allow water to percolate downwards into the ground. No impermeable layers have been observed.
 - The Chalk contains fractures and fissures, through which water may migrate vertically downwards, and in extreme weather could also migrate laterally. It is not considered possible to identify individual fissures which could cause lateral movements of water as the act of physical excavation and observation would destroy the continuity of the fracture system and therefore be counter-productive.
 - The surface drainage now in place is considered by Network Rail to reduce the likelihood of a similar failure in the future.
 - The slopes of the cutting have now also been netted, which although this wouldn't prevent a potential failure of the cutting slope, is likely to mitigate the impact of such a failure by containing debris and preventing encroachment on the track.
3. ORR is therefore content that Network Rail have met the requirements of the recommendation and taken appropriate steps to prevent reoccurrence at this location.
4. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:
 - taken the recommendation into consideration; and

- has taken action to implement it

Status: Implemented.

Previously reported to RAIB

5. On 9 August 2018 ORR reported that Network Rail had not provided a response to the recommendation. Our understanding was that Network Rail had a plan to put in surface drainage at Watford Tunnel in the next few months. We were also aware that Network Rail were not planning to progress work on sub-surface flows and had asked to see the risk assessment that supports this decision.

Update

6. On 20 May 2019 Network Rail provided a closure statement including the following conclusions :

Groundwater behaviour

- *Surface water under normal rainfall conditions will infiltrate and migrate downwards through the permeable superficial soils and Upper Chalk to reach the deep regional ground-water table. No impermeable layers have been observed in the current GI or are visible in the slope face which could impede this flow.*
- *Under extreme rainfall conditions, near-surface saturation may occur leading to increased surface water 'sheet' flows and preferential flows through joints / fissure systems.*
- *Deep 'cut-off' style drainage measures would be as likely to introduce concentrations of flow into fissures as to convey water away from the slope. The benefit is not proved.*
- *A propensity for fissure flow within the Upper Chalk may be foreseen, but specific hazards are unforeseeable because of the unpredictability of the joint systems.*

Mitigation Measures

- *Proposed drainage measures will contain and direct concentrated surface water-flows to the 'Flume like' structure such that 'clean' water reaches the track, thus managing concentrated surface water flows.*
- *Empirical observation suggests that, in the absence of a deep 'cut-off' drain to manage sub-surface flows the meshing (provided to manage the hazard of raveling or block failure on the slope face) would be adequate to contain similar failures and prevent encroachment on the track.*

Application

- *There is no requirement to mandate measures to manage groundwater flows in Chalk cuttings.*
- *As part of routine Asset Management practice Chalk cutting slopes across the country will continue to be identified for intervention in accordance with the guidance provided through policy. Given the inherent variability of ground conditions it is always good practice to review the likely surface and groundwater risks and this should continue.*

Previously reported to RAIB

Recommendation 1

The intent of this recommendation is to mitigate the risk of a future slope failure at this historically vulnerable location. Effective implementation of the drainage work described in paragraph 144 is likely to contribute to implementation of this recommendation.

Network Rail should implement measures to improve surface drainage (eg by provision of a suitable drainage system encompassing the crest), in the vicinity of the 2016 Watford tunnel landslip. It should also investigate whether it is necessary to take steps to manage sub-surface flows which were observed during this accident and could reoccur during a future event.

ORR decision

1. Network Rail have not formally responded to this recommendation. Our understanding is that Network Rail have a plan to put in surface drainage at Watford Tunnel in the next few months. We are also aware that Network Rail are not planning to progress work on sub-surface flows and have asked to see the risk assessment that supports this decision.
2. In accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:
 - not provided a response setting out how the recommendation will be delivered.

Status: Insufficient response. ORR will advise RAIB when further information is available regarding actions being taken to address this recommendation.

Information in support of ORR decision

3. Network Rail have not provided a response to the recommendation. From informal discussions with Network Rail we are aware they have a plan to install surface drainage at the incident site, but have chosen not to take forward work on sub-surface flows.